

Phytohormone Cross-talk: Exogenous Application of Putrescine and Spermidine Ameliorate the Heat Stress-associated Damage in Wheat (*Triticum Aestivum*)

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Abstract—Heat stress induces oxidative stress in plants causing the production of reactive oxygen species (ROS). Overproduction of ROS causes oxidative damage to membrane lipids, enzymatic proteins and nucleic acid. Antioxidants and associated-enzyme defense network operated inside the plant system for scavenging the free radicals like superoxide dismutase (SOD), catalase CAT, peroxidases and ascorbate, glutathione, α -tocopherol, carotenoids etc. Polyamines (PAs) are polycations which inhibit lipid peroxidation under HS. Very limited information is available on the mechanistic effect of polyamines on the defense network of wheat under HS. In the present study, we have observed the effect of putrescine (20 mM) and spermidine (1 mM) on the activity of anti-defense network of wheat (SOD, CAT and GPX) and lipid peroxidation under HS. Putrescine and spermidine treated wheat were observed more tolerant to oxidative stress due to increases in the antioxidative enzymes (SOD increases by 4 U/mg, CAT by 15 U/mg and GPX by 50 U/mg) and antioxidants. Increase in the activity of antioxidant enzymes was observed higher in HD2894 (thermotolerant), as compared to HD2329 (thermosusceptible). It has been observed that the effect of putrescine in increasing the antioxidant enzymes (SOD, CAT and GPX) and antioxidant is more as compared to spermidine. Combination of putrescine and spermidine synergistically enhances the defense network of wheat. There is a need to further characterize the effect of putrescine and spermidine through molecular tools in order to manipulate the defense pathway of wheat for the development of tolerant cultivar.

Keywords: SOD, CAT, Wheat, Heat stress, Ascorbate, GPX.